USEPA comments on Effects Analysis Appendix C- Flow, Passage, Salinity, Turbidity (11/4/11)

Residence time

Appendix C addresses changes in salinity, turbidity, and migratory corridor quality but touches only peripherally on residence time. For water quality effects (other than salinity), residence time is probably the most important metric to consider because it changes the timing and duration of various toxins on organisms in the affected area. Modeling of residence time (as was done here in support of analysis of dissolved oxygen) can also be used to assess changes in the fate and transport of contaminants of known origin such as ammonium and selenium which would be of considerable use in evaluating the effects of toxins. Modeling results on residence time in the south delta should be included as an explicit effect of the various alternatives so that it can be referenced in regard to toxins in Appendix D, as well as dissolved oxygen here in Appendix C.

Changes in residence time affect aquatic productivity. Such changes in aquatic productivity will affect pH, bioaccumulation and thereby the impact of various contaminants. Residence time estimates can identify the seasons and conditions under which toxic effects on particular species will be altered. If longer residence times occur at different times under the different scenarios, that will change the impacts on particular species. The particle tracking model used in this appendix for dissolved oxygen studies should be expanded to address changes in the fate and transport of toxins of known origin for use in Appendix D.

The preliminary project is expected to change residence time of water in the southern delta, especially in the Stockton Deepwater Ship Channel where low levels of dissolved oxygen have long been a problem and much work has been done to address the problem. As accurately described in the modeling discussion (in Section C.5.4.5), dissolved oxygen is controlled by a variety of factors: temperature, residence time, organic loading, and aeration. Residence time in a tidal system is difficult to quantify, but the DSM2-based particle tracking model used here is a good approach. Results are reported as the number of days for 50% of the particles to leave the delta under various operational scenarios. This may not be chemically or biologically the most important measure but is a good index of effect and could provide the basis for solid conclusions.

The conclusions of impacts of the preliminary project on flow, passage, salinity, and turbidity should refer to analytical results (modeling for example) and then provide discussion and context. For example, Conclusion 8 does not address modeling results or assumptions, and instead deals entirely with the anticipated benefits of an oxygen diffusion system. On page 90 the conclusion is offered that "DO concentrations in the river channels and bays are typically in equilibrium with atmospheric conditions, and proposed project operations are not anticipated to result in biologically significant changes within the Delta. As a result of these factors, it was concluded that proposed project operations would not result in adverse changes in either water temperatures or DO concentrations within the Delta that would affect the target species." This conclusion is incorrect and at odds with the earlier discussion in the appendix of the factors affecting dissolved oxygen.

Generally, conclusions about estimated impacts should compare modeling results to stated management objectives and/or established biological thresholds as in Water Quality Standards, Basin Plans etc. Conclusions in this document should make explicit reference to modeling results and WQ standards as described in Section C.5.4.5.

Figure 1 takes model outputs from Table C.6.4-220 and compares the results of EBC1 vs PP_LLT, but results are similar for other comparisons of interest. Model results suggest that changes in residence time near Stockton due to the project are likely to be substantial at times. The modeling, appropriately, used a wide range of hydrological conditions, but the modeling discussion bases its conclusions on averages of all conditions. The results can be used to determine whether project impacts lead to greater or lesser frequency in exceeding the established objectives, such as dissolved oxygen standards. For example, under wetter hydrologies, water flows rapidly through the San Joaquin River and impacts of the project are small. Under very dry hydrologies, residence times are already so long that changes due to the project have very little proportional impact. The greatest impacts of the project would be at intermediate conditions when residence times, and dissolved oxygen levels, are most greatly affected by flow changes. Figure 1 shows these patterns in terms of the percent increase in residence time due to the project vs. number of days in the baseline.

By averaging modeling results across all modeled hydrologies, the impacts of the proposed project are confounded with impacts of differences in hydrology. To estimate the impact on DO, the change in residence time for each modeled condition can be used with appropriate models (an entry to which can be found at http://www.sjrdotmdl.org/concept_model/). Then the number of times that the project would result in violations of dissolved oxygen standards (if any) could be easily reported.

After an assessment of effect, it would be appropriate to discuss actions that may mitigate the impacts of this project such as an oxygen diffusion system. (An unfortunate typo in conclusion 8 states that "*Reduction* in Stockton Deep Water Ship Channel DO levels will improve upstream migration conditions," whereas efforts to improve migration have aimed to *increase* DO levels.

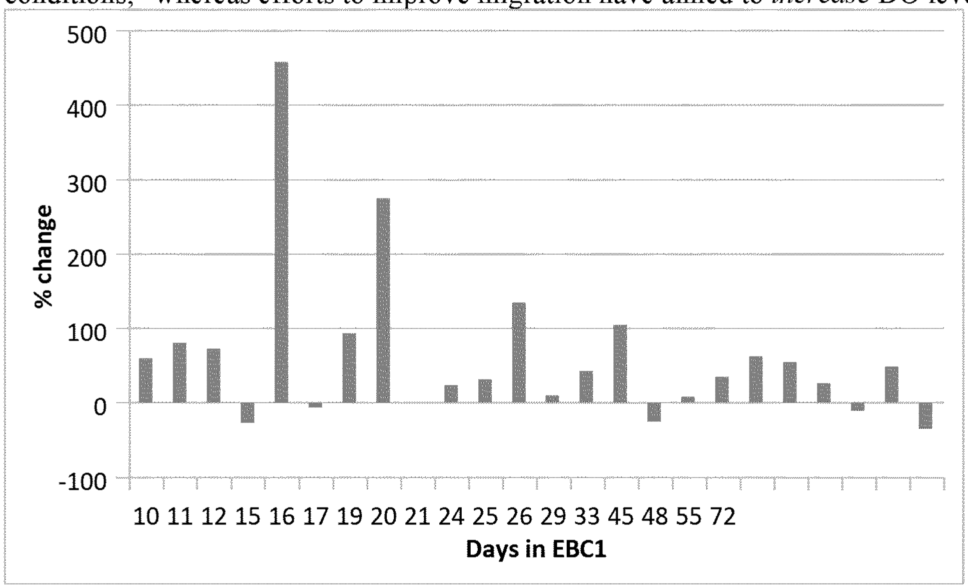

Figure 1. Percentage change in residence time in PP_LLT relation to baseline (ECB1) residence time. Note that at very high residence times the percent change is small. At low residence time the percentage is higher, but the number of days added is small. At intermediate baseline conditions both the number of days and the percentage change is sometimes substantial.

Migratory corridors

Improving migratory passage is an explicit goal of the narrative standard in the SWRCB Water Quality Control Plan. Migratory corridors are a difficult environmental aspect to model, as there are few quantitative tools available and many factors that can affect it. We commend the consultants for their efforts to address this topic. The Delta Passage Model developed by the consultants has not been published and relies on the sorts of linked correlations that the smelt habitat model has been criticized for. Independent review of this tool, and its application here, should be a high priority before any conclusions from its outputs are drawn.

Conclusion 13 says that the preliminary project will improve adult San Joaquin salmon and steelhead migration, due to San Joaquin water arriving in the western delta. Such conclusions should be accompanied by reference to quantitative model outputs and appropriate biological references to support the idea that the level attained is biologically relevant.

Contrariwise, the conclusion that there will be no change in San Joaquin smolt survival due to decreased exports from the south delta seems to be an over-extension of the conclusions of Newman (2008). For Sacramento smolts, the improved O&M conditions in wetter hydrologies are claimed to compensate for the worsened conditions in drier years. Under current conditions, wetter hydrologies have lower entrainment rates and lower impacts on migration. The logic of balancing improvements at wet times of least impact and degradations under dry conditions when they are presently having their greatest impact is unclear. For all species of concern, changes in entrainment rate due to changes in migratory success should be quantified and compared.